

WHAT IS CLAIMED IS:

- Sub 3* 1. A process for heating semiconductor substrates comprising the steps of:
- 5 placing a semiconductor substrate in a processing chamber;
- directing light energy onto said semiconductor substrate for heating said semiconductor substrate, said light energy contacting said semiconductor substrate at an angle of incidence of
- 10 greater than 0° ; and
- wherein said light energy contacts said semiconductor substrate in a p-polarized plane or near said p-polarized plane.
2. A process as defined in claim 1, wherein said light energy
- 15 is emitted by an incoherent light source.
3. A process as defined in claim 1, wherein said light energy contacts said semiconductor substrate at an angle of incidence of greater than 10° .
4. A process as defined in claim 1, wherein said light
- 20 energy is polarized creating a first p-polarized light energy beam and a second p-polarized light energy beam, said first and second p-polarized light energy beams being directed onto said semiconductor substrate.
5. A process as defined in claim 1, further comprising the step of collimating the light energy prior to polarizing said light energy.
- 25 6. A process as defined in claim 5, wherein said light energy is collimated using a reflective device.
7. A process as defined in claim 5, wherein said light energy is collimated using an optical lens.



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sources comprise light energy sources.

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about 40° to about 85°.

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semiconductor substrate onto said semiconductor substrate.

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chamber; and

substrate from at least a first laser and a second laser, wherein said first

laser emits light at a first wavelength range and said second laser emits light at a second wavelength range, said first wavelength range being different than second wavelength range.

17. A process as defined in claim 16, wherein said first
5 wavelength range and said second wavelength range do not overlap.

18. A process as defined in claim 16, wherein said laser beams
are in a p-polarized state.

19. A process as defined in claim 16, wherein said first laser
emits a first laser beam and said second laser emits a second laser
10 beam and wherein said first and second laser beams contact said
semiconductor substrate at an angle of incidence greater than 10° .

20. A process as defined in claim 19, wherein said first and
second laser beams contact said semiconductor substrate at an angle of
incidence of from about 40° to about 85° .

21. A process as defined in claim 19, wherein said first laser
beam contacts said semiconductor substrate at a first angle of incidence
and said second laser beam contacts said semiconductor substrate at a
15 second angle of incidence, said first angle of incidence and said second
angle of incidence being different.

22. A process as defined in claim 16, wherein said
semiconductor substrate is heated by other energy sources in addition to
said laser beams.

23. A process as defined in claim 16, wherein at least certain of
said laser beams are pulsed laser beams.

24. A process as defined in claim 16, wherein besides said
25 laser beams, said semiconductor substrate is heated by an electrical
resistance heater.

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25. A process as defined in claim 16, further comprising the step of redirecting any portion of said laser beams that are reflected off said semiconductor substrate back onto said semiconductor substrate.

5 26. A process as defined in claim 16, further comprising the step of sensing the amount of light energy from one of the lasers that is reflected off the semiconductor substrate and, based on this information, changing the configuration of at least one of the lasers in order change the amount of light energy absorbed by the semiconductor substrate.

10 27. A process for heating semiconductor substrates comprising the steps of:

placing a semiconductor substrate in a processing chamber;

directing a pulsed laser beam onto said semiconductor substrate;

15 configuring said pulsed laser beam to strike said substrate at an angle of incidence of at least 10° ; and

configuring said pulsed laser beam to strike said substrate so that said pulsed laser beam strikes said substrate in a p-polarization plane.

20 28. A process as defined in claim 27, wherein said pulsed laser beam strikes said semiconductor substrate in order to carry out an ion implantation anneal process.

25 29. A process as defined in claim 27, wherein said pulsed laser beam strikes said substrate at an angle of incidence of from about 40° to about 85° .

30. A process as defined in claim 27, wherein, in addition to said pulsed laser beam, said semiconductor substrate is heated by other energy sources.

31. A process as defined in claim 27, wherein said

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semiconductor substrate is contacted by at least one other laser beam in addition to said pulsed laser beam, said other laser beam contacting said semiconductor substrate at an angle of incidence that is different than the angle of incidence at which pulsed laser beam contacts said semiconductor substrate.

32. A process as defined in claim 31, wherein said other laser beam is a also a pulsed laser beam.

33. A process as defined in claim 27, wherein said semiconductor substrate is contacted by at least one other laser beam in addition to said pulsed laser beam, said other laser beam having a wavelength range that is different than the wavelength range of said pulsed laser beam.

34. A process as defined in claim 27, further comprising the step of redirecting any portion of said pulsed laser beam that is reflected off said semiconductor substrate onto said semiconductor substrate.

35. A process as defined in claim 27, wherein besides said laser beam, said semiconductor substrate is heated by an electrical resistance heater.

36. A process as defined in claim 27, further comprising the step of sensing the amount of the pulsed laser beam that is reflected off of the semiconductor substrate and, based upon this information, changing the configuration of the pulsed laser beam in order to change the amount of light energy absorbed by the semiconductor substrate.

37. A process for heating semiconductor substrates comprising the steps of:

placing a semiconductor substrate in a processing chamber; and

directing at least a first laser beam and a second laser beam onto said semiconductor substrate for heating said substrate,

said first laser beam contacting said semiconductor substrate at a first angle of incidence, said second laser beam contacting said semiconductor substrate at a second angle of incidence, said first angle of incidence being different than said second angle of incidence, each of
5 said first and second laser beams contacting said semiconductor substrate in a p-polarized state.

38. A process as defined in claim 37, wherein said first laser beam and said second laser beam are emitted from the same laser.

39. A process as defined in claim 37, wherein said first laser beam is emitted from a first laser and said second laser beam is emitted from a second laser.
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40. A process as defined in claim 37, wherein at least said first laser beam comprises a pulsed laser beam.

41. A process as defined in claim 37, wherein said first angle of incidence and said second angle of incidence are greater than 10° .
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42. A process as defined in claim 37, wherein said first angle of incidence and said second angle of incidence are from about 40° to 85° .

43. A process as defined in claim 37, wherein said first laser beam has a first wavelength range and said second laser beam has a second wavelength range, and wherein said first wavelength range is different from said second wavelength range.
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44. A process as defined in claim 37, wherein said semiconductor substrate is heated by other energy sources in addition to said first laser beam and said second laser beam.

45. A process as defined in claim 37, further comprising the step of sensing the amount of said laser beams that is reflected off of said semiconductor substrate, and based on this information, changing the configuration of at least one laser in order to change the amount of light energy absorbed by said semiconductor substrate.
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46. A process as defined in claim 37, further comprising the step of sensing the amount of light energy from one of the lasers that is reflected off the semiconductor substrate and, based on this information, changing the configuration of at least one of the lasers in order change the amount of light energy absorbed by the semiconductor substrate.

47. A process for heating semiconductor substrates comprising the steps of:

placing a semiconductor substrate in a processing chamber, said substrate being at least substantially surrounded by a slip free ring; and

directing light energy onto said slip free ring for heating said semiconductor substrate, said light energy contacting said slip free ring at an angle of incidence greater than 0° , said light energy also contacting said slip free ring in a p-polarized state, an elliptically polarized state, or near a p-polarized state.

48. A process as defined in claim 47, wherein said semiconductor substrate is also heated by an electrical resistance heater.

49. A process as defined in claim 47, wherein said slip free ring is heated by at least one laser.

50. A process as defined in claim 47, wherein said light energy is also directed onto and heats said semiconductor substrate.

51. A process as defined in claim 47, wherein said slip free ring is coated with an anti-reflective coating.

52. A process for heating semiconductor substrates comprising the steps of:

placing a semiconductor substrate in a processing chamber;

rotating said semiconductor substrate in said

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processing chamber;

directing light energy onto said semiconductor substrate for heating said semiconductor substrate, said light energy contacting said semiconductor substrate at an angle of incidence of greater than 0° , said light energy also contacting said semiconductor substrate in a p-polarized state, an elliptically polarized state, or near a p-polarized state, said light energy contacting said semiconductor substrate at a location on a radius of said substrate and wherein said entire radius of said substrate is heated through the rotation of the wafer.

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